CS10
The Beauty and Joy of Computing

Lecture #1
Welcome; Abstraction

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Computer Science
Summer Instructor
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CS10 : YOU'LL LOVE IT!

Watch the student testimonials about CS10, what it means to them, and how it has changed their lives. Inspiring!

`inst.eecs.berkeley.edu/~cs10/`

CS10 in one slide

- **Big Ideas of Programming**
  - Abstraction
  - Algorithms (2)
  - Recursion (2)
  - Functions-as-data, λ (2)
  - *Programming Paradigms*
  - *Concurrency*
  - *Distributed Computing*
- **Beauty and Joy**
  - "CS Unplugged" activities
  - All lab work in pairs
  - Two projects in pairs
    - Of your own choice!
  - One blog
    - Of your' own choice!

- **Big Ideas of Computing**
  - HowStuffWorks
    - 3D Graphics
    - Video Games
    - Computational Game Theory
  - Research Summaries
    - AI
    - HCI
  - Apps that Changed the World
  - Social Implications of Computing
  - Saving the World with Computing
  - How Twitter Works (guest lecture)
  - Cloud Computing
  - Limits of Computing
  - Future of Computing

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Format & Textbooks

- **Format (14 hrs/wk * 8 wks)**

M	Tu	W	Th
Lab		Lab	
Disc		Disc	
Lec	Lec	Lec	Lec

contributed articles

Designing Games With A Purpose

- **Selected Reading**
  - Taken from great book ("Blown to Bits" by Abelson, Ledeen & Lewis) + articles + videos
  - Current events EVERY DAY (e.g., IBM's Watson vs Jeopardy)
- **All resources FREE**
  - Even clickers!

IS ABSTRACTION THE KEY TO COMPUTING?

contributed articles

Scratch: Programming for All

. . .

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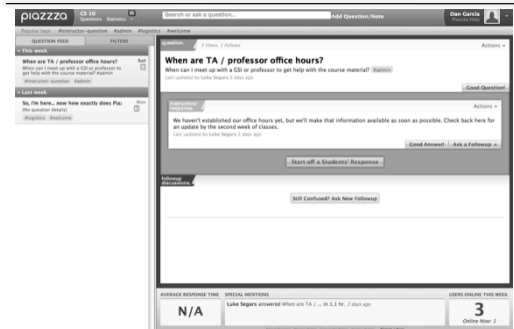

Peer Instruction

- **Increase real-time learning in lecture, test understanding of concepts vs. details**
- **As we complete a "segment" we ask multiple choice question**
  - 1-2 minutes to decide yourself
  - 2 minutes in pairs/triples to reach consensus. Teach others!
  - 2 minute discussion of answers, questions, clarifications

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Piazza for {ask,answer}ing questions

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Grading

- **EPA**
  - Effort
  - Participation
  - Altruism
- **Not Competitive**
  - Absolute Grading (No Curve, No Limit on A's)
- **Course Historical Average = B/B+**
  - CS Department Average = B-

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Abstraction

- **Detail removal**
  - "The act or process of leaving out of consideration one or more properties of a complex object so as to attend to others."
- **Generalization**
  - "The process of formulating general concepts by abstracting common properties of instances"

Henri Matisse "Naked Blue IV"

Detail Removal

General Purpose Online Map   Selected Roads   Our Result

Automatic Generation of Detail Maps
Maneesh Agrawala (UCB EECS), among others
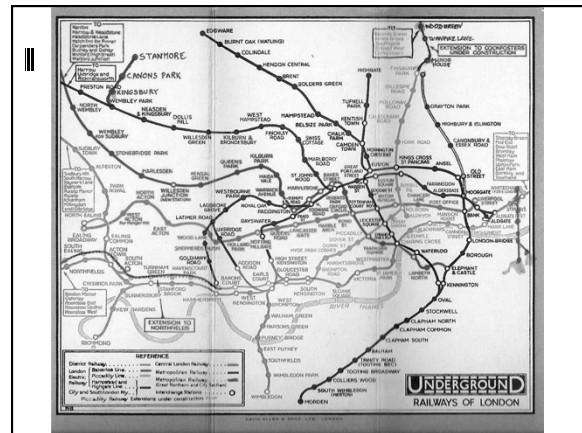

Detail Removal (in CS10)

- **You'll want to write a project to simulate a real-world situation, or play a game, or …**
- **Abstraction is the idea that you focus on the essence, the cleanest way to map the messy real world to one you can build**

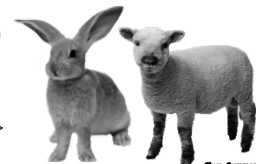The London Underground 1928 Map & the 1933 map by Harry Beck.

Generalization Example

- **You have a farm with many kinds of animals**
- **Different food for each**
- **You have directions that say**
  - To feed dog, put dog food in dog dish
  - To feed chicken, put chicken food in chicken dish
  - To feed rabbit, put rabbit food in rabbit dish
  - Etc…
- **How could you do better?**
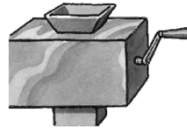 - To feed <animal>, put <animal> food in <animal> dish

Generalization (in CS10)

- You are going to learn to write functions, like in math class:

    y = sin(x)

- You should think about what inputs make sense to use so you don't have to duplicate code

"Function machine" from *Simply Scheme* (Harvey)

Summary

- Abstraction is one of the big ideas of computing and computational thinking

- Think about driving. How many of you know how a car works? How many can drive a car? Abstraction!

Anyone who knows how to drive can operate a hybrid, an electric car, or a diesel car, because they've kept the same Abstraction!
(right pedal faster, left pedal slower)